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Predation Effect of the Brown Lynx Spider, *Oxyopes badius* YAGINUMA, on Young Larval Colonies of the Pine Moth, *Dendrolimus spectabilis* BUTLER

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松井 均[1)]: クリチャササグモのマツカレハ若齢幼虫集団に及ぼす影響

Abstract: The predation effect of *Oxyopes badius* YAGINUMA upon young larval colony of the pine moth, *Dendrolimus spectabilis* BUTLER, was investigated. Egg masses which contained different numbers of eggs (20～300) were attached on black pine trees and the emerged immature larvae were exposed to the predation of *O. badius*. *O. badius* mainly preyed on the 1st–2nd instar larvae. The larvae in colonies of small size suffered from predation more intensively than those of large one, and this tendency was well expressed by the following equation $Y=51.4 \log X-63.9$ ($r=0.814$) (Y: survival rate, X: the number of immature larvae at the time of emergence).

Introduction

Immature larvae of the pine moth, *Dendrolimus spectabilis* BUTLER, generally suffers from a high mortality more than 70～80% during the 1st–2nd instar (KOKUBO, 1965; KANAMITSU, 1962). Among various mortality factors bringing about this high mortality, natural enemies play an important role, since the mortality due to natural enemies occupies more than 85% of that (MATSUI, 1978). However, natural enemies in the field consist of various species and differ in their activities, e.g. ants and long-legged wasps, *Polistes clinensis* FABRICIUS act not only as predator but also disturber to the young larvae of the pine moth (MATSUI & KOKUBO, 1974), spiders only as predator (MATSUI, 1976), and parasited wasps, *Hyposoter takagii* MATSUMURA, act only as "disturber" (MATSUI, 1978). Here, the disturber means an animal which gives an adverse effect to the insect in question through interference often than direct attack. Among lynx spiders, *Oxyopes sertatus* L. KOCH and *O. badius* YAGINUMA were reported as predators to the pine moth by FURUTA (1977), and their characteristics to young larvae were described by MATSUI (1977).

This paper deals with an analysis on the relationship between the colony size of immature pine moth larvae and the predation effect of *O. badius* on it.

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Method

In order to ascertain the predation effect of *O. badius* on the colonies of young pine moth larvae, a potted young black pine, *Pinus thunbergii* PARL., 1∼2 m in height, was caged with a net of 1 mm in mesh, and total 22 caged trees were used for the experiment. An egg mass of the pine moth was attached on the needles of the tree. The egg masses used were obtained from the laboratory reared moths, and the attached number of eggs to each tree was differed from 20 to 300. Experimental animals were the female adults of *O. badius,* which were collected from the young black pine plantation and starved for 2∼3 days. Before 2∼3 days from the hatching of the pine moth eggs, 3 individuals were introduced into 13 cages each. The other 9 cages without predators were used as control. After hatching of pine moth eggs, the number of young larvae was counted every day during the period of 1st–2nd instar. Experiments were conducted from late July to early August in 1972∼'78 at Tokyo University Forest Experimental Station at Tanashi.

Result

Fig. 1 compares the survivorship curves of larvae in colonies exposed and not exposed to the predation of *O. badius*. Survivals in the colonies under predation decreased more rapidly than that in control. When the colony size of the pine moth larvae was small (d∼f in Fig. 1), survival rate decreased rapidly below than 10% within 2∼3 days after emergence. However, when colony size was large, survival rate still remained at 65% even after 10 days from emergence (a and b). It is considered from the above results that *O. badius* effectively attacks immature pine moth larvae, especially those at 1st instar. In addition, a small colony of larvae was apt to be suffered from predation severely as compared with a large one.

Fig. 2 shows the survival rate of 1st–2nd instar larvae plotted against their colony sizes expressed in number at the time of emergence. In the control cages, the survival rate of young larvae showed about 78% irrespective of a great difference in colony size. Contrary, in the cages wherein spiders were introduced, the survival rate of larvae showed a great change with respect to colony size. This relationship was expressed by the equation $Y = 51.4 \log X - 63.9$ ($r = 0.814$), here Y means survival rate of 1st–2nd instar larvae and X number of immature larvae at the time of emergence.

When we consider all cages of experiments including those of control, the total mortality recorded in respective colonies of larvae fell in a range from 30 to 98%. The mortality in the spider-free colonies was about 22%. Therefore, if we deduct the percentage from the lowest and highest values of the above mentioned mortality range, the remainder will indicate the mortalities resulted from the predation of spiders, i.e., 33–22 = 11% and 98–22 = 77%.

From these facts, it can be said that this spider is mainly acting as a predator than a disturber to the immature larvae of the pine moth.

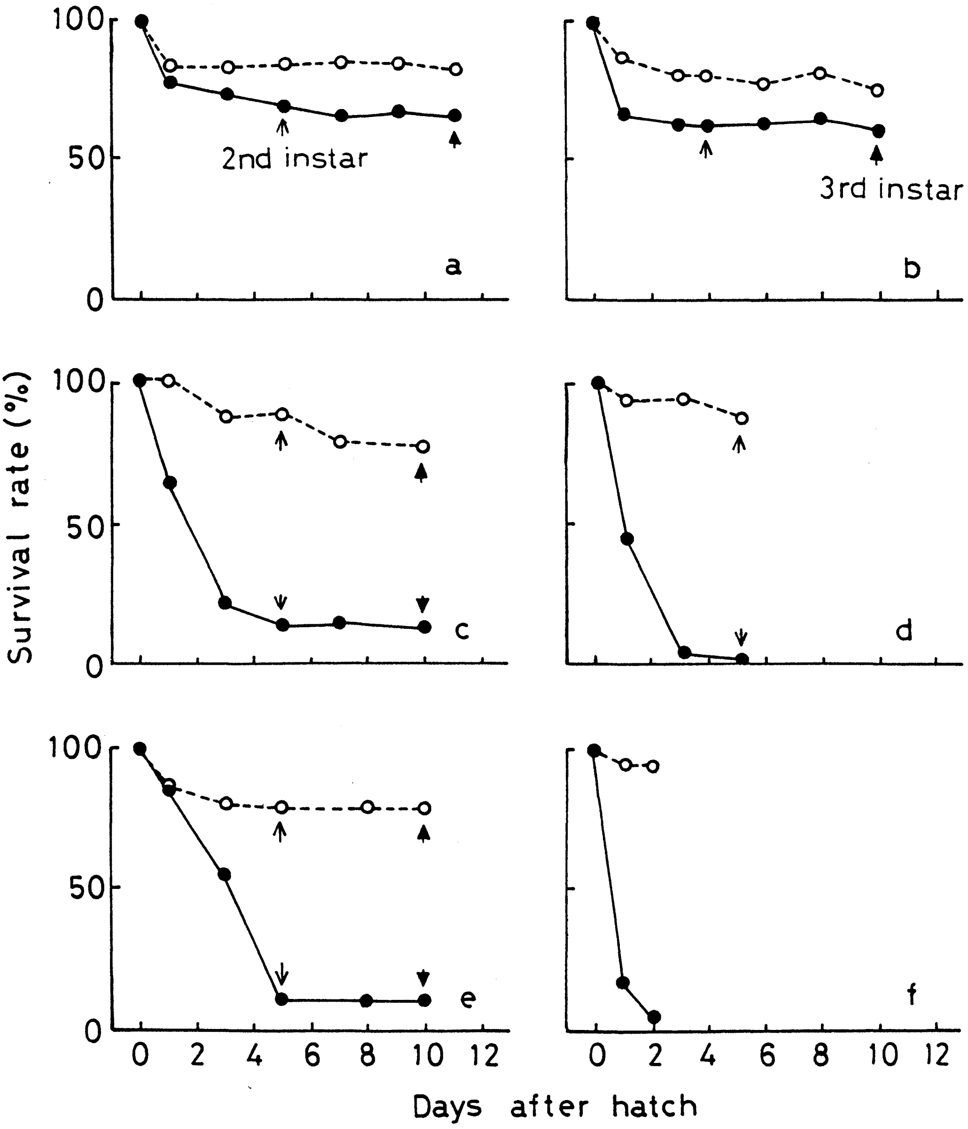

Fig. 1 Survivalship curves of young pine moth larvae in a colony.

O---O Control

●——● *Oxyopes badius* was introduced

No. of hatched larvae in a colony was; a: 297 b: 257 c: 101 d: 51 e: 28 f: 18

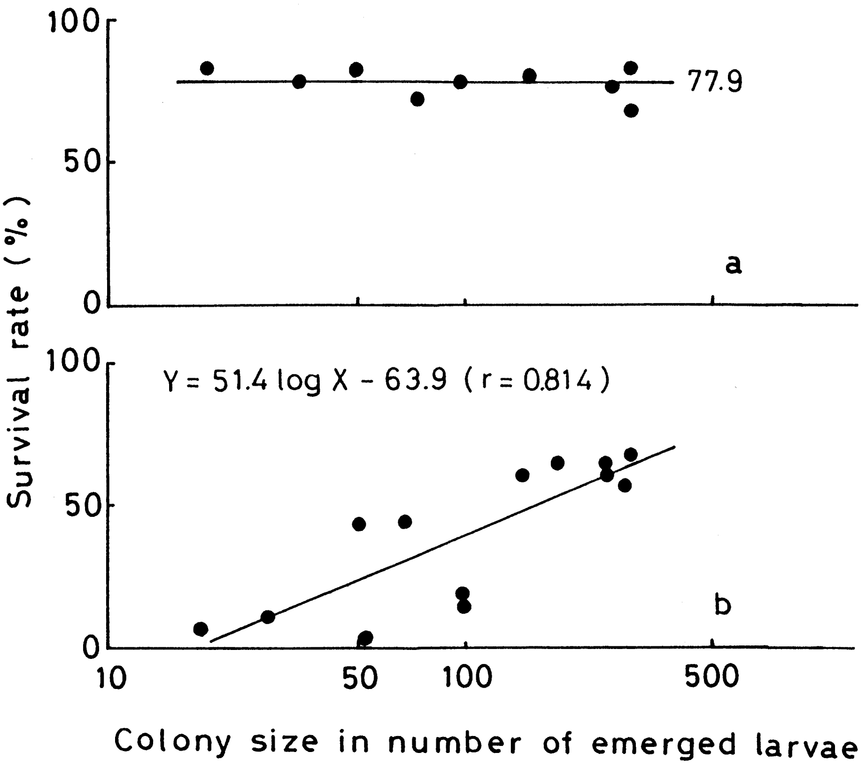

Fig. 2 Survival rates of 1st–2nd instar larvae exposed to and free from spider's predation plotted against their colony sizes at the time of emergence.
a: Control
b: *Oxyopes badius* was introduced

Discussion

Several authors stressed the important of "disturber" as a natural enemy (ITO & MIYASHITA, 1968; KIRITANI & HOKYO, 1970; DEMPSTER, 1971; NAKASUJI *et al.*, 1973; MATSUI & KOKUBO, 1974). DEMPSTER (1971) found a significant correlation between the survival rate of young larvae and the rearing number in a cluster of *Tyria jacobaeae* L. A similar relationship between the survival rate of larvae and the colony size was also observed in *Nezara viridula* L. (KRITANI *et al.*, 1966). NAKASUJI *et al.* (1973) reported that some predators often gave an additional mortality other than the real predation to the prey population by acting as a disturber.

In this report, I investigated the effect of predation by *O. badius* on the 1st–2nd instar pine moth larvae. According to FURUTA (1977), *Oxyopes sertatus* L. KOCH and *O. badius* YAGINUMA, rarely attacked the large larvae of pine moth and gypsy moth, *Lymantira dispar,* and their predation generally occurred only during the period of 10 days after emergence of larvae. In the cases of *Agelena opulenta* L. KOCH and *Theridion tepidrariorum* (C. KOCH), attack frequency to 2nd instar larvae was observed to be about half of that to 1st instar (MATSUI, 1977). These characteristics reported in the other spider species were also recognized in the present experiment on *O. badius*. Therefore, the effectiveness of *O. badius* as a predator to young pine moth larvae may be exhibited only in the place where the egg masses of pine moth are generally small in size (HIROSE, 1967), or in the time when the egg mortality and/or larval mortality just after emergence is quite high.

摘要

クリチャササグモのマツカレハ若齢幼虫集団に及ぼす影響について調査した．クリチャササグモはおもに1齢幼虫を捕食した．その影響は幼虫集団が小さいほど大きかった．マツカレハふ化幼虫集団の大きさとクモの捕食の影響をうけた幼虫集団の生存率との関係は $Y=51.4 \log X-63.9$ ($r=0.814$)(Y:生存率, X:ふ化幼虫数)の関係式で示すことができた．

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